Editorial

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Biographical notes: Bruno Chanetz received his PhD in 1986 and HDR in 1997 from the University of Lyon I. He was Lecturer at the Ecole Centrale de Paris from 1996 to 2003, then Associate Professor at the University of Versailles from 2003 to 2009 and since 2009 he is Associate Professor at the University of Paris-West. He was Research Engineer at ONERA in 1983, Head of Hypersonic Group in 1990, Head of Hypersonic Hyperenthalpic Project in 1997, Head of Experimental Simulation and Physics of Fluid Unit in 1998 and Deputy Director of the Fundamental and Experimental Aerodynamics Department in 2003. He is AAAF member, member of the Aerodynamic Committee and author of 50 articles in archival journals.

Daniel Caruana is a graduate of the Conservatoire National des Arts et Métiers (C.N.A.M.) and currently a Senior Research Engineer at ONERA. He is in charge of plasmas for flow control and also involved in many aeronautics studies for aerodynamic and aero-acoustic control, flow physics, actuators definition and design, control technique. His current research activities focus on flow physics and control (separation, buffeting, jet noise, etc.), plasma physics, actuators (fluidic vortex generator, synthetic jet, plasmas, trailing edge devices), and flow control methods. He is the coordinator of the PLASMAERO European project.

Jean-Pierre Bœuf is the Director of Research at CNRS. He is an Engineer from Ecole Supérieure d'Electricité. He received his PhD in Plasma Physics from Université of Paris XI Orsay in 1985. He is currently working at the LAPLACE laboratory in Toulouse. His expertise concerns low temperature plasmas and he is or has been involved in a number of projects related to the physics and applications of these plasmas: plasmas for aerodynamics applications, space propulsion, ion sources for the neutral beam injection of fusion devices, plasma for microwave applications, UV sources, lasers, material processing, etc. He has authored more than 130 papers in international journals.

The design of tomorrow's aircraft will be dictated by the need to have more environmentally 'green' aircraft in line with the ACARE 2020 vision for example.

This can be achieved in different ways which can be: reduced structural weight, improved combustion, and optimised aerodynamic performance.

Today's aircraft structures are designed for a single aerodynamic optimisation, to give the best performance between each aerodynamic configuration. Furthermore, today, fuel consumption represents approximately 22% of the direct operating cost (DOC). If drag can be reduced by 1%, this would correspond to a reduction of 0.2% of the DOC (1.6 ton less fuel or ten additional passengers on a long range flight).

To be able to optimise for the complete aircraft mission, from take-off to cruise to landing, either globally over the aircraft structure or locally in real-time reaction to local phenomena is needed. This could ensure a continuous optimisation of the aerodynamic behaviour of the aircraft for every individual flight. It is obligatory to study breakthrough and emerging technologies going beyond the limitations of the aircraft's fixed structure and to use efficient actuators to optimise the flow over the airfoil.

Research work on new technologies and innovative devices has been or is being performed with the overriding aim of improving the aircraft's aerodynamic performance by controlling air flows and improve combustion.

Among the innovative solutions, the use of plasma technologies has shown itself to be very promising from both a performance point of view and in terms of the diversity in potential applications from external flow control (lift/drag), internal (engine) flow control and combustion, enhancement and noise attenuation.

The main advantages of plasmas devices are their ability for real-time control at high frequency, their manufacturing and integration simplicity, their low power consumption, and their robustness. There are no moving parts and only two thin electrical wires needed to link them to their electrical power supply located near or far, and so making them a safe and reliable technical solution.

Given the importance of the subject, ONERA decided to gather its own actions concerning plasmas for aerodynamics and combustion in a unifying research plan called 'Action de Recherche Fédérative Plasma' (ARF Plasma). This working group is interacting with all French laboratories involved in this subject. The present issue is the consequence of a workshop organised at ONERA in Toulouse at the beginning of 2011 by Daniel Caruana, chairman of the ARF Plasmas.